DOCUMENT RESUME

ED 138 463 SE 022 425

AUTHOR Lynch, Mervyn A.; Offet, Lorna
TITLE Science Safety Procedure Handbook.
INSTITUTION Edmonton Catholic Schools (Alberta).
PUB DATE 77
NOTE 66p.; Contains colored pages

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS *Elementary Secondary Education; *Guides; Laboratory Procedures; *Laboratory Safety; *Safety; *Science Education; Science Materials
IDENTIFIERS Canada

ABSTRACT

This booklet outlines general safety procedures in the areas of: (1) student supervision; (2) storage safety regulations, including lists of incompatible chemicals, techniques of disposal and storage; (3) fire; and (4) first aid. Specific sections exist for elementary, junior high school, senior high school, in which special procedures are detailed for units of study at the appropriate level. Also included is the Edmonton Catholic School District's regulations regarding accidents in the school. (CS)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED138463

SE

EDMONTON CATHOLIC SCHOOLS

Science Safety Procedure Handbook

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY
Richard L. Laplante
Dir. of Curriculum
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER.

SE 022 425

Edmonton Catholic Schools

1977

Copyright © 1977 by the Edmonton Catholic School District, 9807 - 106 Street, Edmonton, Alberta T5K 1C2.

No portion of the publication may be reproduced in whole or in part by electronic duplication or any other method unless permission is obtained in writing.

Materials are for educational use only. Materials must not be resold or provided to commercial companies.

SCIENCE SAFETY PROCEDURE HANDBOOK

MERVYN A. LYNCH

LORNA OFFET

Edmonton Catholic Schools
EDMONTON, Alberta

A C K N O W L E D G E M E N T S

Edmonton Catholic Schools acknowledge with appreciation the contribution of the several science teachers who have expressed a need for a science safety booklet.

Advice was formally and informally obtained from several individuals over the years.

A special acknowledgement to:

- Dr. John Acheson - Dept. of Instruction
- Mr. Mervyn Lynch - Assistant Supervisor of Science
- Mrs. Lorna Offet - Teacher

.....

- Miss Janice Doblanko - Secretary
- Mr. Karol Forgac - Photographer
- Mrs. Rhonda Tailleur - Secretary

INTRODUCTION

The science classroom or laboratory is a relatively safe place. Nevertheless there has been a need for a safety procedures booklet for several years.

This booklet will serve as a quick reference for all principals, teachers and laboratory aides.

General procedures are outlined on:

- Student Supervision
- Storage and Disposal of Chemicals
- First Aid
- Fire Precautions

Specific sections exist for Elementary, Junior High School, Senior High School and the District's regulations regarding accidents in the school.

TABLE OF CONTENTS

Introduction..... ii.

Supervision of Students..... 1-2

Storage Safety Regulations 3-5

Incompatible Chemicals..... 6

Disposal of Chemicals..... 7-8

Fires..... 9

First Aid..... 10-12

ELEMENTARY SCHOOL..... 13-16

JUNIOR HIGH SCHOOL..... 17-22

Life Science..... 17-18

Earth-Space Science..... 19-20

Physical Science..... 21-22

SENIOR HIGH SCHOOL..... 23-48

Biology..... 23-26

Chemistry..... 27-44

Physics..... 45-47

Administrative Regulations on Accidents..... 48-51

Bibliography..... 51

Selected Index..... 52

- Teachers should endeavour to have information on students who may have allergies, or other health problems that may make it dangerous for them to handle animals, chemicals, etc.

- Teachers should familiarize themselves with procedures to deal with students who suffer from epilepsy.

  In the event of an epileptic attack the victim must be prevented from hurting himself/herself. Convulsive movements should not be restrained.

SUPERVISION OF STUDENTS

1. Any student involved in laboratory work is to be under direction of a teacher.

2. Students should be made aware of general safety procedures and actual use of safety equipment. (e.g. fire extinguishers, glass tubing inserts, eye wash bottles.

3. Students should be warned of the dangers of opening laboratory table gas valves when not in use.

   The laboratory gas supply should be controlled from the master gas valve in the room.

SUPERVISION OF STUDENTS

4. Students should be made aware of emergency procedures. (e.g. use of exits, first aid equipment etc.)

5. No laboratory activity should be conducted by students unless it has been previously attempted by the teacher.

6. Loose clothing and long hair present laboratory hazards.

7. Students should be encouraged to wear laboratory coats or aprons in any activity involving chemicals. Safety glasses or goggles are also advisable in many instances.

8. Drinking from laboratory glassware is unwise.

9. No eating is allowed in the laboratory.

10. Students must not be permitted to work in the laboratory or preparation rooms without the supervision of a teacher. Assistance must always be available is case of injury.

11. Students should not sit or lean on laboratory tables as corrosive residues or glass fragments may be present.

12. Pupils should be cautioned against deep inhalation of vapours from open containers. Identification can be made by fanning traces of vapour to the nose.

13. First aid supplies should be in a convenient location and readily available.

STORAGE
SAFETY
REGULATIONS

Storage in stockrooms should be limited to common chemicals normally used in the laboratory and are not in the dangerous category.

A dangerous chemical is one which spontaneously decomposes or is unstable, highly reactive, flammable or volatile.

1. BENZOYL PEROXIDE: *should not be stored in the school. This substance can decompose instantaneously and explosively.*

2. CORROSIVES: *Hydrochloric, nitric, sulphuric potassium hydrogen sulphate acids, sodium hydroxide, hydrogen peroxide.*

   Quantities of these materials stored in the school should be minimal.

   These materials should be separated from flammable solids and liquids, since corrosives may create enough heat to start a fire.

   Corrosives should be stored in a non metallic, non combustible and acid resistant interior.

   Perchloric acid should not be stored in the school.

STORAGE SAFETY REGULATIONS

3. FLAMMABLE LIQUIDS: should be stored in a fire resistant cabinet.

   All elementary-junior high schools, junior high schools and senior high schools should have a specially constructed fire resistant cabinet for storing such liquids.

   The cabinet should be placed away from all sources of heat or other chemicals which evolve heat from reaction with air or moisture.

4. FLAMMABLE SOLIDS: The majority of these chemicals should not be stored in schools.

   White phosphorus ignites upon contact with air. If storage is necessary it must be under water.

   Red phosphorus ignites when subjected to friction and therefore should be kept in a tightly sealed container and physically separated from other dangerous chemicals.

5. GAS CYLINDERS: compressed gas cylinders should be stored in fire resistant, dry and cool areas. Medical size cylinders should be in a specially built frame.

6. GLASS TUBING: should be stored horizontally and supported the full length of the tubing.

STORAGE SAFETY REGULATIONS

7. LABELING: All chemicals must be adequately labeled, particularily those that are transfered from one container to the other.

The date received from the manufacturer should be written on all new stocks of material.

8. RADIOACTIVE MATERIALS: All containers containing radioactive materials should be labeled with an appropriate warning notice.

The symbol for radiation is a black trefoil in a yellow background. Rolls of adhesive tape bearing the symbol are available from laboratory suppliers.

Caution should be exercised at all times in handling radioactive materials. See Physics section.

9. WATER-REACTIVE CHEMICALS: Sodium and potassium are examples of solids which react violently with water or moisture.

They should be stored in minimum quantities under kerosene or mineral oil preferably in metal jacketed containers.

The storage area should be dry to avoid condensation.

Powdered metals such as aluminum and magnesium should be kept in moisture proof containers and stored in a dry, cool location.

THESE CHEMCIALS	SHOULD NOT COME IN CONTACT WITH:	INCOMPATIBLE CHEMICALS
Hydrocarbons: e.g. Propane, Benzene, Gasoline, etc.	*Fluorine* *Chlorine* *Bromine* *Sodium Peroxide*	
Iodine	*Acetylene* *Ammonia* *Hydrogen*	
Mercury	*Acetylene* *Ammonia*	
Nitric Acid (con.)	*Acetic Acid* *Hydrogen Sulfide* *Inflammable liquids and gases*	
Potassium Chlorate	*Sulfuric Acid* *Glycerine* *Ethylene Glycol*	
Sodium Peroxide	*Ethyl or Methyl Alcohol* *Glacial Acetic Acid* *Carbon Disulfide* *Glycerine* *Ethylene* *Glycol* *Ethyl Acetate*	
Sulfuric Acid	*Potassium Chlorate* *Potassium Perchlorate* *Potassium Permanganate* *Similar compounds of other light metals*	

DISPOSAL OF CHEMICALS

Disposing of solid chemicals in the garbage can should be done with extreme care since potentially dangerous reactions may occur when two or more substances react.

City by-laws govern the disposal of chemical and solid wastes in the sewer system.

ACIDS AND BASES *should be thoroughly diluted before disposing in the sewer system.*

Any solution having a pH lower than 5.5 or above 12 should not be discharged.

FLAMMABLE LIQUIDS: *Many compounds commonly used in the laboratory fall into this category.*

These should not be disposed in the sink or sewer system.

For small quantities it is preferable to absorb on paper and evaporate in the fume hood.

For disposal of larger quantities of flammable liquids or solids, contact the Fire Inspector of Schools. (Phone: 425-7927)

DISPOSAL OF CHEMICALS

HYDROGEN PEROXIDE: *should be thoroughly diluted before discharging in the sewer system.*

For disposal of larger amounts of inorganic materials, contact the caretaker in your school or the science supervisor.

MERCURY: *should not be disposed in the sink. It is quite easily cleaned by passing through layers of cheesecloth or a handkerchief.*

Excess mercury could be donated or exchanged with another school.

FIRES

There are several fire hazards in the laboratory. Some of these are:

(a) FLAMMABLE ORGANIC SOLVENTS such as ethyl alcohol, benzene, acetone etc.

These liquids should never be heated with a naked or open flame. An electric heating mantle may be used.

(b) Some gases such as hydrogen and methane can form an explosive gas/air mixture and are easily ignited.

All laboratories should be equipped with a fire extinguisher.

It is suggested that high school laboratories be also equipped with a fire blanket.

Teachers, laboratory aides and students should be familiar with the location of fire extinguishers and fire blankets.

This does not preclude the ringing of the fire alarm if the fire is deemed to be serious or uncontrollable.

Students should be aware of the procedures to leave the room in the event of fire. This should be emphasized during school fire drills. Teachers should familiarize themselves with the location of the master gas control valve in the laboratory. This valve can also be used to control gas leaks prior to getting further assistance.

1. All laboratories should be equipped with a first aid kit and a laboratory emergency chart such as Fisher Laboratory Emergency Chart or similar.

2. Laboratories should have:

   (a) 500 ml of 5% of acetic acid solution
   (b) 0.5 kg sodium bicarbonate
   (c) 500 ml of 1% sodium thiosulfate to treat iodine burns
   (d) Eye wash bottle

3. Injuries

   Teachers and laboratory aides should familiarize themselves with the District's regulations regarding accidents to students.

   These regulations are quoted in this manual under Administrative Regulations on Accidents.

   Injuries that are likely to occur are:

   (a) Burns
   (b) Cuts
   (c) Eye Injuries
   (d) Inhalation of poisonous gases.

FIRST AID

FIRST AID

(BURNS)

CHEMICAL BURNS: are likely to be caused by corrosive substances such as acid, bases or alkalis etc. Precautions should be taken when using these substances. See Chemistry section.

If burns occur wash with larger amounts of water. If damage to skin is severe, medical attention should be obtained.

HEAT BURNS: Burns are usually caused by non-luminous flames, burners that have blown back, hot glass, overheated electrical equipment.

Students should be warned of the potential for burns under these circumstances. In the event of burns the following procedures should be followed.

1. Cool the injury as quickly as possible by immersion in cold water or irrigate with cold water.

2. After cooling apply a dry sterile dressing.

3. Remove anything of a constricting nature. e.g. rings

4. Lotions, ointments or oily dressings should not be applied.

5. Blisters should not be pricked.

If severe, medical attention should be obtained.

Extremely cold substances, such as solid carbon dioxide can also cause severe burns. Such substances should be handled with gloves.

FIRST AID

CUTS:

(CUTS)

These should be washed with water and a sterile dressing applied.

If bleeding is excessive or continuous, medical attention should be obtained.

EYE INJURIES:

(EYE)

Eye injuries could be minimized if students wear safety glasses.

If the injury is due to a splash of corrosive liquid, the eye should be held open and washed with large amounts of pure water.

It is advisable that eye injuries be seen by a doctor.

INHALATION OF POISONOUS GASES:

(POISONOUS GASES)

Get the patient into fresh air.

Teachers should ensure that the room is adequately ventilated prior to working with these gases so that more drastic measures will not have to be adopted.

ELEMENTARY SCIENCE

Attention is drawn to general supervision of students, First Aid, storage of chemicals on pages 1 - 12 of this booklet.

ELEMENTARY SCIENCE

- Caution and observation should be exercised when plants, flowers, and bread mold are brought into the classroom. Some students may be allergic to pollen, spores, etc.

All chemicals should be in a special room or properly secured by the teacher.

Solid chemicals should be handled with a spatula or scoopula, never with bare hands.

ACIDS AND BASES

Acetic and hydrochloric acids are most common at the elementary school. Both these acids, like all acids, should be diluted by adding the acid to cold water.

Ammonium hydroxide has a pungent odour to many individuals. It should be diluted by adding the ammonium hydroxide to cold water.

Other bases or alkalis should be diluted in the same manner.

Sodium hydroxide or lye: Students should be cautioned against tasting this substance.

If swallowed, the mouth should be thoroughly washed with water. Plenty of water should be given to drink followed by weak vinegar.

ANIMALS (LIVE)

Students may have certain allergies, thus caution must be exercised before bringing animals to class.

Animals should be kept under the best possible conditions of health, comfort and well being at all times.

Permission should be obtained from a teacher for a student to bring animal or animals to class.

Parental permission must be obtained for a student to bring an animal home from school. Certain members of the family may have allergies.

Gloves are recommended when working with live animals. Wash up before and after exposure. If the skin is broken, medical advice should be obtained.

ANIMALS (PRESERVED)

The specimen should be thoroughly washed with water before using.

Formaldehyde irritates the skin of some individuals. The skin should be thoroughly drenched with water if contact is made with this chemical.

DRY ICE AND EXTREMELY COLD SUBSTANCES

DRY ICE:

Dry ice, like all extremely cold substances, should never be handled with bare hands since burns may occur.

Preferably dry ice should be handled by the teacher.

DRY CELLS:

Dry cells should be used in any experiments involving electricity.

HEAT:

Great care must be exercised with open flames. If heat is needed, alcohol burners or candles are advisable. Teacher demonstration or the very strictest of supervision is required.

MERCURY:

Mercury should be avoided at this level. Students should be warned of its dangers.

Alcohol thermometers rather than mercury are preferable.

MIRRORS, LENSES, PRISMS:

Sharp edges on these should be ground with emery cloth.

MIRRORS
LENSES
PRISMS

SUN:

The sun should never be observed directly. The image should be projected onto a piece of white paper.

SUN

VOLCANOES:

Artificial chemical volcanoes are hazardous and should be avoided.

VOLCANOES

JUNIOR HIGH SCIENCE

LIFE SCIENCE

BLOOD TEST:

It is not advisable to have each student perform blood tests at this level. Demonstration by teacher is preferable.

Only sterile needles or lancets should be used. These should be discarded after use.

HANDLING OF LIVE ANIMALS:

Animals should be kept under the best possible conditions of health, comfort and well being.

No vertebrate animal should be subjected to any procedure or experiment which interferes with its normal health or causes pain or distress.

Permission should be obtained from a teacher for a student to bring animal or animals to class.

Gloves are recommended when working with live animals. Wash up before and after exposure.

Care must be exercised in giving students animals to take home. Parental permission must be obtained. Members of the family may have allergies for instance.

Great care must be taken or avoid dissection of dead animals found in the field or highway. These may be diseased.

LIFE SCIENCE

HEATING SOLUTIONS:

Pyrex or hard glass tubes should be used

Electric or water baths are preferable to open flames when testing for sugars, proteins.

WORKING WITH BACTERIA:

Pathogenic bacteria should not be used in schools.

Wire loops used for transferring culture of bacteria should be flamed after each transfer.

Dishes passed around for inspection should be taped in covered state.

WORKING WITH PRESERVED SPECIMENS:

Formaldehyde irritates the skin of some individuals. The skin should be thoroughly drenched with water after touching formaldehyde.

If formadehyde vapour irritates the eye, the eye should be drenched with water.

WORKING WITH BREAD MOLD, FLOWERS, PLANTS:

Teachers should control the materials and specimens brought by students into the laboratory, as some students may be allergic to pollen, spores etc.

EARTH-SPACE SCIENCE

ACIDS:

Hydrochloric acid is mainly used in the Earth Science Program. Dilute solutions must be used for demonstrating.

(a) chemical weathering
(b) mineral identification

BAROMETRES:

Mercury barometres with open reservoirs should not be used.

MISCELLANEOUS:

Chemical Volcanoes are hazardous and should be avoided.

Breaking of Rocks and Minerals - A face shield or goggles must be used.

Crystallization Experiments - Alum is preferable to sulfur.

Heating Hydrated Rock: This process may produce steam causing the rock to explode. Shield or goggles must be used.

EARTH – SPACE SCIENCE

Observing the Sun: The sun should never be observed directly.

Ultraviolet Light: This wavelength of light can cause damage to the eye. Thus, care must be exercised in its use for mineral identification.

Students should be encouraged to wear laboratory coats/aprons and goggles in the laboratory.

BOILING UNDER LOW PRESSURE:

Round bottom flasks should be used to minimize the danger of implosion.

BURNERS:

See the chemistry section in this booklet for safety procedures in handling burners.

Students should be aware that often the blue flame of a burner is not visible under certain conditions.

HEAT EXPERIMENTS:

Many substances have the same appearances whether hot or cold.

Particular attention should be paid to hot beakers, glass tubing, etc.

LIGHT:

Lenses, mirrors, prisms with sharp edges should be ground with emery cloth.

PHYSICAL SCIENCE

MECHANICS:

Moving objects such as pulleys, projectiles etc. present some change. Thus, appropriate caution must be taken.

Care should be exercised when using equipment with unguarded moving parts such as many vacuum systems.

VACUUM SYSTEMS:

All equipment should be examined for stress and strain before and after filling.

SENIOR HIGH SCIENCE

BIOLOGY

Biology teachers should familiarize themselves with the general safety procedures, such as supervision of students, storage, fires, etc. as outlined in this manual.

1. BLOOD TEST:

BLOOD TEST

Use only sterile needles or lancets to draw blood. These should be discarded after use.

2. ETHER:

ETHER

Extreme care should be exercised in handling ethers.

Ether is extremely flammable and explosive, thus no open flames or heat should be in the vicinity.

Also exposure to massive amounts of ether can cause intoxication and collapse.

Storage - long term storage of ether is not advisable, since peroxides are formed. This is hastened when ether is frequently exposed to air or sunlight.

Supplies should be purchased in the smallest containers practical. If storage is necessary for a short period, the ether may be placed in a specially constructed fire resistant cabinet.

Spills - Ether spills can be removed with a sponge, rag, or paper towels. The wet material should be placed in the fume hood and allowed to evaporate.

FORMALDEHYDE

FORMALDEHYDE:

This substance irritates the skin of some individuals. The skin should be thoroughly drenched with water after touching formaldehyde.

If formaldehyde vapour irritates the eye, the eye should be drenched with water.

HANDLING OF ANIMALS

HANDLING OF ANIMALS:

Animals should be kept under the best possible conditions of health, comfort and well being.

No vertebrate animal should be subjected to any procedure or experiment which interferes with its normal health or causes pain or distress.

Each school should develop a policy on the length of time, animals may be kept in a classroom.

Permission should be obtained from a teacher for a student to bring an animal or animals to class.

If animals act sluggish or are inactive for lengthy periods of time, contact should be made with an appropriately trained person for diagnosis.

HANDLING OF ANIMALS: (cont.)

Gloves are recommended when working with live animals. Wash up before and after exposure.

Care must be exercised in giving students animals to take home. Members of the family may have allergies for instance.

Great care must be taken or avoid dissection of dead animals formed in the field or highway. These may be diseased.

HEATING OF SOLUTIONS (e.g. TEST FOR SUGAR, PROTEINS):

HEATING OF SOLUTIONS

Pyrex or hard glass test tubes should be used.

Electric heaters or water baths are preferable to open flame.

WORKING WITH BACTERIA:

WORKING WITH BACTERIA

Pathogenic bacteria should not be used in schools.

Wire loops used for transferring culture of bacteria should be flamed after each transfer.

Dishes passed around for inspection should be taped in covered state.

WORKING WITH FLOWERS, BREAD MOLD:

WORKING WITH FLOWERS AND BREAD MOLD

Care should be taken that pollen or spores are not excessively distributed throughout the classroom. Some students may be allergic to pollen or spores.

Students must obtain teacher approval before doing a project.

STUDENT PROJECT

CHEMISTRY

The main gas valve should be turned off at the end of each lab as well as at each outlet.

Students should be made aware that often the blue flame of a burner is not visible under certain lighting conditions.

LIGHTING A BURNER:

(a) Close the air hole by turning the sleeve.
(b) Have the gas lighter or lighted match ready.
(c) Turn on the gas slowly.
(d) Light the gas keeping you head and hair away from the burner.
(e) Open the air hole until the flame just loses its yellow tinge.
(f) Turn the gas tap until the flame is about 5 cm high.

BURNERS

PROPANE BURNERS:

Portable propane burners should be on a secure stand to minimize the possibility of rolling over.

PROPANE BOTTLES

Use in classrooms not equipped with natural gas, small B.T.C. (Board of Transport Commission) or I.C.C. (Interstate Commission) containers having a maximum water capacity of two and one-half pounds may be used.

The nozzle assembly must bear one or other of the stamps U.L.C. (Underwriters Laboratory of Canada) or C.S.A. (Canadian Standards Association.)

The number of propane burners allowed in a school must not exceed 24 units with a maximum number of 10 in a classroom (Administrative Regulation 120-11a: Edmonton Catholic Schools 1975)

Bottles and burners should not be used in close proximity to each other to prevent the possibility of flame impingement.

Empty bottles should be given to the caretaker for disposal.

CHEMICALS

For most chemicals listed, the following procedures should be used in the event of a mishap.

AFFECTED EYES: Irrigate with water. In severe cases obtain medical attention.

SKIN CONTACT: Drench with water unless otherwise specified. The exceptions are iodine, bromine and organic compounds.

ACIDS

DILUTING: Acids are always added to cold water. Dilute acids in storage area prior to use in the lab. Use only dilute solutions of acids unless otherwise specified.

PIPET FILLING: Students should never pipet by mouth action. A pipet bulb or suction bulb could be used but pipet filler is more convenient. (Contact Mr. Mervyn Lynch for information regarding pipet filler.)

SPILLS: Acid spills should be treated as if they were concentrated solutions. Spills should be neutralized with excess solid sodium bicarbonate (baking soda). Spills on clothing should be neutralized with a solution of sodium bicarbonate.

(ACETIC)
(HYDROCHLORIC)

AVOID:
- Breathing vapour
- Contact with eyes and skin.

STORAGE: Should be stored in a cool location.

(HYDROFLUORIC)

AVOID:
- Breathing vapour as it is extremely harmful.
- Contact with eyes, skin, clothing.

SKIN CONTACT: Irrigate immediately and continuously with cold water until medical attention is obtained.

If medical attention is delayed, apply a dilute solution of ammonia in water.

ACIDS

(NITRIC)

AVOID: - Breathing vapour
- Contact with eyes and skin

(POTASSIUM HYDROGEN SULPHATE)

AVOID: - Contact with skin and eyes
- Solids and solutions severely irritate the eyes and skin.

(SULFURIC)

AVOID: - Contact with eyes and skin

USE OF: - When 18 M of sulfuric acid is required, a pipet filler should be used.

ALKALI AND ALKALINE EARTH METALS

STORAGE: These metals are stored under mineral oil as they are flammable on contact with water.

HANDLING: Always handle with tweezers or tongs. Small pieces no larger than the size of a pea are used. When showing their reaction with water, the reaction should be carried out in an open container.

- CALCIUM
- LITHIUM
- POTASSIUM
- SODIUM

BURNS: Remove adhering metal, drench with water.

BASES

STORAGE: Solid sodium hydroxide and potassium hydroxide should be stored in tightly closed bottles as they tend to absorb moisture from the air and harden into a solid mass.

HANDLING: Solid sodium hydroxide and potassium hydroxide should never be handled with bare hands since they dissociate in contact with moisture and cause burns. Concentrated ammonium hydroxide solutions should be handled only in a fume hood.

SPILLS: Strong bases such as sodium hydroxide, potassium hydroxide and ammonium hydroxide are corrosive and spills should be treated with a dilute solution of acetic acid.

SOLUTIONS: Preparing solutions of strong bases with a high heat of solution should be carried out in a sink using a pyrex container. Solids should be added to the cold water while stirring.

AVOID: - Breathing vapour - Contact with eyes and skin.	AMMONIUM HYDROXIDE
AVOID: - Contact with eyes and skin	POTASSIUM HYDROXIDE (CAUSTIC POTASH)
	AND
If Swallowed: Wash out mouth thoroughly with water and give plenty of water to drink followed by vinegar or 1 per cent acetic acid.	SODIUM HYDROXIDE (CAUSTIC SODA)

BARIUM COMPOUNDS

HANDLING: All barium compounds except barium sulfate are considered to be poisonous when taken by mouth. They are also harmful when absorbed by the skin.

BROMINE

HANDLING: Great care should be taken when handling pure bromine. The container should only be handled while wearing gloves and should be opened only in a fume hood. Bromine water should have a cover on it in the lab.

AVOID:
- Breathing vapour
- Contact with eyes and skin.

SKIN CONTACT: Drench with water and then bathe with a dilute solution of ammonia or sodium thiosulfate in water.

PREPARATION: Should be carried out under a fume hood.

SPILLS: Ventilate lab if possible. Vacate the laboratory. If the spill is serious, call the Fire Department.

CHLORINE

AVOID:
- Breathing vapour
- Contact with skin and eyes

PREPARATION: Should be carried out under a fume hood.

AVOID: - Contact with eyes and skin	HYDROGEN PEROXIDE
AVOID: - Inhaling gas as it is extremely harmful. GAS INHALED: Remove from source, apply artificial respiration if breathing has stopped.	HYDROGEN SULFIDE
AVOID: - Contact with eyes and skin	HYPOCHLORITE SOLUTIONS
AVOID: - Breathing vapour - Contact with eyes and skin AFFECTED EYES: - Irrigate with water. SKIN CONTACT: Drench with 1% solution of sodium thiosulfate.	IODINE
AVOID: - Breathing dust	LEAD COMPOUNDS

MERCURY

Students should not be allowed to play with mercury (quicksilver) under any circumstances. Mercury should not be exposed.

Handling: *use a tray to catch any spills*

Avoid: *breathing vapor*
contact with eyes and skin

Mercury Spills: *can be cleaned up with an aspiration device or with a capillary pipette attached to a suction bulb*

NICKEL SALTS

Avoid: *breathing dust*
contact with eyes and skin

Affected Eyes: *irrigate with water*

Skin Contact: *drench with water wash with soap and water*

NITROGEN DIOXIDE

Avoid: *breathing gas - extremely harmful*

Obtain medical attention immediately if inhalation has been appreciable.

ORGANIC COMPOUNDS

Many organic compounds are highly flammable and should be heated with an electric mantle.

There is some evidence that many organic compounds are or may be carcinogenic. Since the vapors of many organic compounds can also be harmful, in other ways,

labs containing organic compounds should be done in a well ventilated room.

ORGANIC COMPOUNDS (CONT.)

BENZENE

Avoid: *inhalation of vapor*
contact with eyes and skin (liquid absorbed by skin)

Vapor inhaled: *remove from exposure seek medical attention if severe*

Skin Contact: *drench with water, wash with soap and water*

CARBON DISULFIDE

Avoid: *breathing vapor (extremely harmful)*

Vapor Inhaled: *remove from exposure, obtain medical attention. Apply artificial respiration of breathing has stopped*

CARBON TETRACHLORIDE

Carbon tetrachloride should never be used to extinguish a fire.

Avoid: *breathing vapor*
contact with eyes and skin

Vapor Inhaled: *remove from exposure, obtain medical attention if severe. Apply artificial respiration if breathing has stopped*

Skin Contact: *drench with water and wash thoroughly with soap and water*

TOLUENE

Avoid: *breathing vapor*
contact with eyes and skin (liquid absorbed by skin)

Vapor Inhaled: *remove from exposure, keep warm*

Skin Contact: *drench with water, wash thoroughly with soap and water*

PHOSPHORUS (WHITE OR YELLOW)

STORAGE: - *under water*

HANDLING: - *Phosphorus should be handled with tongs or tweezers and cut under water.*

AVOID:
- *exposing solid to air*
- *inhaling ignited phosphorus*
- *Contact with eyes and skin*

SKIN CONTACT: - *Drench with water and then swab for 15 minutes with a 3% solution of copper sulfate.*

These chemicals should not be available to students as they can be used in making explosives.

POTASSIUM CHLORATE

AND

POTASSIUM NITRATE

AVOID: - *Contact with eyes and skin.*

SILVER NITRATE

AVOID: - *Contact with skin and eyes*

SODIUM SULFIDE

Avoid: - *Inhalation of gas*

SULFUR DIOXIDE

Vapour Inhaled: *Remove from exposure.*

In severe cases, obtain medical attention.

GLASSWARE

GLASS TUBING

PROCEDURES:

(a) Bottles that are full or partially full with liquids should not be picked up by the neck as the weight of the liquid may be sufficient to shatter the bottle.

(b) Storage: refer to storage in this handbook

(c) Collection and disposal of broken glass:
Broken glass should be cleaned up immediately and put into a special container for broken glass only. A piece of plasticene is handy for picking up small slivers. Caution students against using chipped or cracked glassware and of removing broken glass from sinks.

(d) Cleaning Glassware:
Clean glassware directly after use. Only alkonox or other detergents should be used by students for cleaning.

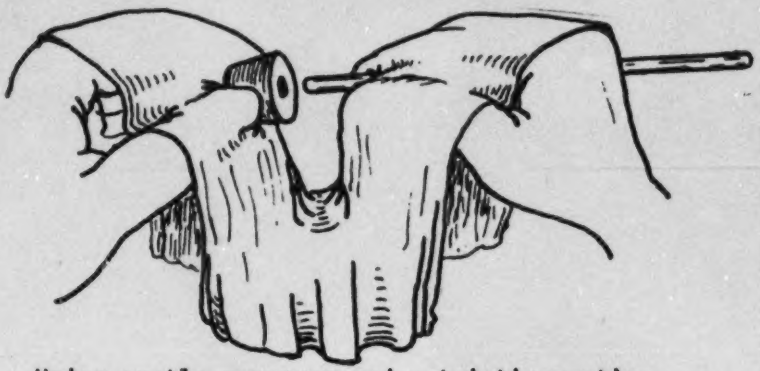
(e) Lengths of glass tubing should always be carried vertically.

GLASSWARE

GLASS TUBING

(f) Inserting tubing in rubber stoppers:

- make sure the stopper is pliable.
- Lubricate the hole and the end of the tubing with water.
- After wrapping both hands with opposite ends of a cloth, hold the stopper in one hand and grasp the tubing near the stopper with the other hand as shown in the diagram.



- Using gentle pressure and a twisting motion, carefully insert the tubing into the hole.
- While adjustments for depth are being made, continue to protect the hands with the cloth.

(g) Cutting glass tubing:

- Place tubing on flat surface.
- Use a sharp file and press just enough to scratch.
- Protect hands with cloth or gloves.
- Hold tubing with thumbs opposite scratch and break away from face.
- Fire-polish ends.

GLASSWARE

GLASS TUBING

(h) Removal of rubber stoppers from glassware:

To avoid breakage and accidents,

- Place the stopper on the floor and roll it under the shoe with sufficient force to overcome the adhesion

OR

- Hold the stopper under a swift stream of water while pulling the rubber away from the glass. Let the water fill the space. Keep repeating until stopper is loose.

(i) Heating: Pyrex glassware is always used for heating materials.

- When heating test tubes use a test tube holder. Test tubes should be held on a slant and should be slowly moved back and forth over the flame. Test tubes should never be pointed toward another person.

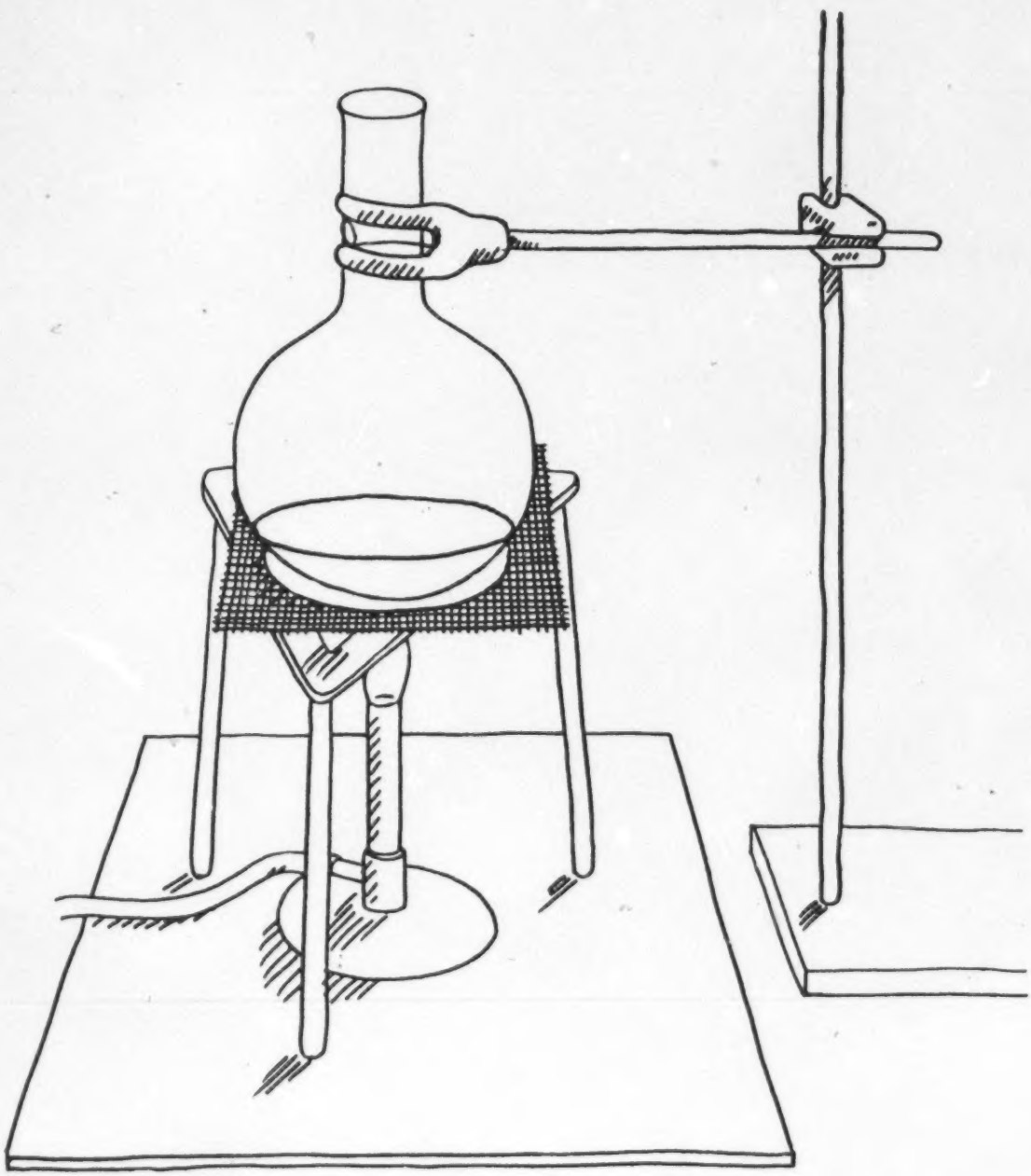
UNSAFE

SAFE

- When heating materials in a flask, the neck of the flask should be held in place by a clamp.

GLASSWARE

FLASK



PHYSICS

High voltages in conjunction with vacuum or gas discharge tube when the potential difference is 5 kv or more can produce damaging radiation.	DISCHARGE TUBES
A radiation check should be made on these discharge tubes.	
The Supervisor of Science may be contacted regard procedures.	
Do not use worn wires - connections should be immediately replaced when there is any sign of thinning insulation.	ELECTRICAL
All conductors should be considered live until checked out.	
Power should be turned off before making circuit changes.	
Students should know where the main circuit breaker or breakers are for the laboratory so that a member of the class can act in the event of an emergency.	
Electrical connectors should not be handled with damp hands.	
All circuits should be examined or double-checked by the teacher before the student proceeds with the laboratory.	
If an individual is seized on an electrical device (electrical shock). Shut off the current or cautiously remove contact from the victim. Use heavy rubber or asbestos gloves or a hand inside a glass beaker to push the victim or current source aside.	ELECTRICAL SHOCK

Students should be made aware that often the blue flame of a burner is not visible under certain lighting conditions.	HEAT
Many objects have a similar appearance whether hot or cold. Glass rods, beakers, etc., should not be left in a location where others may handle while hot.	
Care must be exercised in using various light sources such as ultraviolet, etc. These can cause eye damage.	LIGHT
Great care must be exercised in the type of laser purchased for school use.	LASER
There are provincial regulations regard the hazards of laser use. These are not quoted here.	
As a rule when a laser is used	
Keep the level of general illumination high in areas where lasers are operated. Darkened rooms cause the pupils of the eye to dilate and thus increase the amount of energy that may enter the eye.	
Do not count on goggles or safety glasses to protect the eyes.	
Never look into the primary beam.	
It is not advisable to let the laser beam strike exposed skin surfaces.	
Students should be cautioned that the greatest hazards are cause by moving parts, pulleys, projectiles, and failure of equipment.	MECHANICS AND VACUUM SYSTEMS
All machines particularly those that are motor driven,	

should be fitted with appropriate guards.

MECHANICS AND VACUUM SYSTEMS

Vacuum apparatus should be examined before and after filling the equipment.

Plastic (PVC) tubing should be used whenever possible.

RADIOACTIVITY

Radioactive sources must not be allowed to come in contact with the skin.

Protective disposible gloves should be worn.

Hands should be washed and monitored after use.

All bottles containing radioactive materials should be labeled with an appropriate warning notice .

The symbol for radiation is a black trefoil on a yellow background. Rolls of adhesive tape bearing the symbol are available from laboratory suppliers.

REGULATIONS ON ACCIDENTS TO STUDENTS

On the following pages are the District's regulations on Accidents to Students.

(Regulation 103 - Administrative Regulation Handbook, August, 1975)

Most of the section is applicable to the science teacher.

ACCIDENTS

TO

STUDENTS

ACCIDENTS TO STUDENTS REGULATION 103

1. Principals and teachers are responsible for effective supervision of students under their care during all school activities.

2. All school staff, in order to prevent accidents, shall be constant in their attention to unsafe conditions involving equipment, building and school premises. Care should be taken to see that unsafe equipment is not used and that any such equipment and other unsafe conditions are immediately reported.

3. If an accident should occur, the teacher or principal in charge becomes responsible for taking prudent action in dealing with the injured student:

   a) The nature and extent of the injury must be ascertained. Bleeding should be controlled. The school nurse, if she is available, or some other staff member trained in first aid, should be summoned. If no one with such training is available, the principal or teacher in charge must take whatever action seems necessary.

   b) If there is any doubt at all about the extent of the injury, especially if the injury seems serious or if internal injury, or fracture of the skull, spine, or leg is suspected, the patient should not be moved, but should be made as comfortable as possible and kept warm until expert assistance is secured.

      In doubtful cases, an ambulance should be summoned immediately to transport the victim to hospital for treatment.

      When necessary, emergency measures have been taken, the parent should be contacted and advised of the steps taken and asked to get in touch with the family physician.

cont.....

c) If the injury appears to be minor and the patient is able to walk or can be safely carried, he should be taken to the Medical Room of the school and made as comfortable as possible. Additional first aid measures may be taken here.

The parent should be telephoned and fully advised of the situation and subsequent action taken in accordance with their wishes. The student may be transported by taxi or private automobile either to his home or to the hospital.

4. The teacher or principal in charge at the time is responsible for deciding whether the emergency treatment indicated in 3. b) is necessary or if the injury is relatively minor, emergency treatment is not required. In making this judgement, in doubtful cases, it is better to be on the safe side.

5. The principal should be notified as soon as possible as to what action has been taken, and the nature of the accident.

6. Transportation of the injured person either to the hospital or home, by ambulance or taxi, will be paid by the Board providing the bill is signed by the principal and submitted by the company to the central office.

7. Within 24 hours after the occurrence of a serious accident, the principal should send a complete report on the form provided with complete details in quadruplicate - three for the Superintendent and one for the school.

cont.....

8. Students who become ill at school or receive a minor injury must not be sent home unless the parents have been informed that this is being done. It is best to have a child, suffering from an accident or sudden illness, accompanied home by any member of the staff available or by some senior student or students.

9. Any form of medication e.g., aspirin must not be administered or given to any student by staff members unless parents have previously authorized the school to do so in writing.

BIBLIOGRAPHY

Everett, K and Jenkins, E.W. A Safety Handbook for Science Teachers. John Murray, London (Available from Longman Canada Limited, 55 Barber Green Road, Don Mills, Ontario --price $5.70)

Gray, C.H., Laboratory Handbook of Toxic Agents. Franklin Publishing Co, Inc. 397 Lydecker St., Englewood, N.J. 07631-- price $6.50

Teachers who are interested in a more extensive bibliography may contact Mervyn Lynch at 429-7631.

SELECTED INDEX

Acetic Acid, 30
Alkali and Alkaline Earth Metals, 31
Ammonium Hydroxide, 33

Bacteria, 25
Benzene, 37
Benzoyl Peroxide, 3
Bread Mold, 26
Bromine, 34
Burners, 27
Burns, Chemical, 11
Burns, Heat, 11

Carbon Tetrachloride, 37
Chlorine, 34

Discharge Tubes, 45
Dry Ice, 15

Electrical, 45
Electrical Shock, 45
Ether, 23

Formaldehyde, 24

Glassware, 41-44
Glass Tubing, 41-43

Hydrochloric Acid, 30
Hydrofluoric Acid, 30

Iodine, 35

Laser, 46
Lenses, 16

Mercury, 36
Mirrors, 16

Nitric Acid, 31

Phosphorus, 39
Potassium Nitrate, 39

Radioactive Materials, 47

Sodium Hydroxide or Lye, 33
Sulphuric Acid, 31

Vacuum Systems, 46
Volcanoes, 16